

11

DATA SYSTEMS
STATION
DATA AUXILIARY SETS 820D AND 820E TYPES

CHANGES

B. Changes in Apparatus (Components)

<u>B.1 Removed</u>	<u>Replaced By</u>
(CPAR17) Resistor R22, 3.3K KS-13490, L1, ZH Option	Resistor R22, 100 KS-13490, L1, ZJ Option

(CPAR17) Diodes CR1, CR2, CR3, CR4, CR5, CR6, CR7, CR8, KS-16986, L6, ZH Option	Diodes CR1, CR2, CR3, CR4, CR5, CR6, CR7, CR8, 458C, ZJ Option
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B.2 Added

Wire from connector J3-18 is added to TB1-15 on the DAS 820D type. This is identified as wiring option ZK.

D. Description of Changes

D.1 The value of R22 and the code of diodes CR1 through CR8 are changed to facilitate the manufacturing of the CPAR17.

D.2 A wire is provided from connector J3-18 to TB1-15 on the DAS 820D type and is identified as wiring option ZK. Wiring option ZK together with the new feature option ZG (strap between TB1-15 and TB1-6), permits the operation of the test relay in the CPAR17 (mounted in the DAS 820D type) when used in conjunction with the DAS 820K.

D.3 Information Note 3.04 is added as an explanation of D.2.

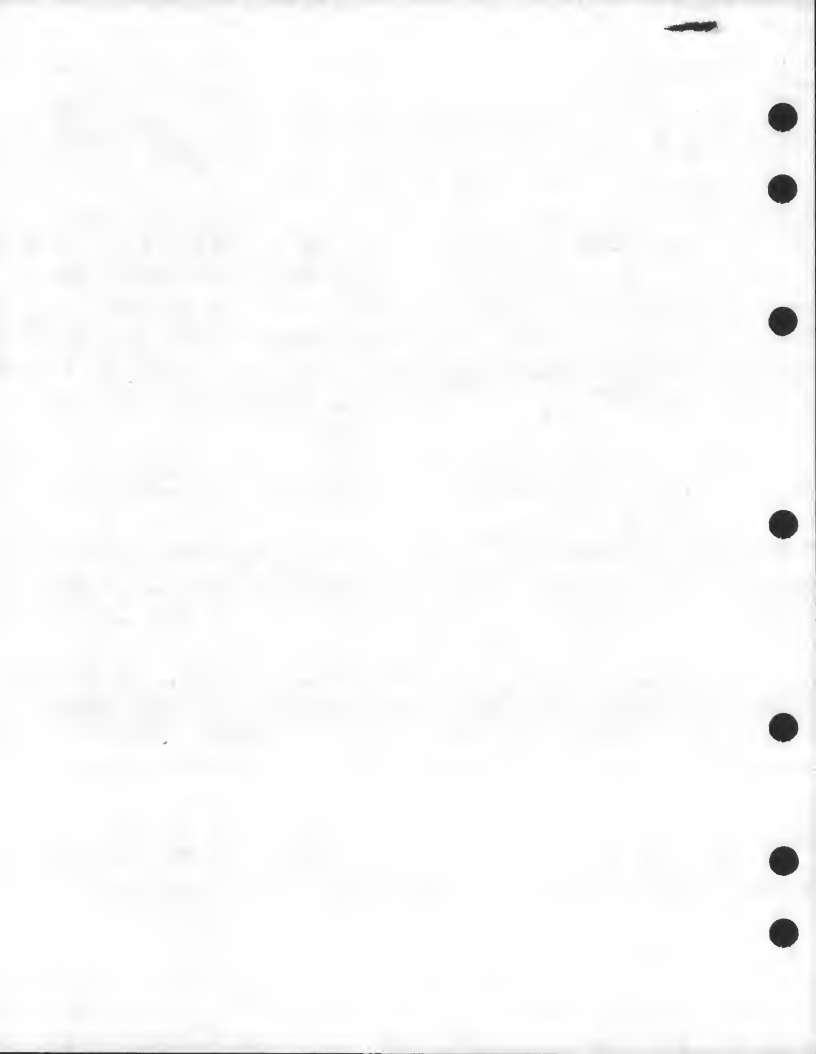
D.4 Information Note 3.05 and Sheet Note 3 on sheet J3 are added to show how to modify the CPAR430 for a TSPS No. 1 hotel/motel station.

D.5 The connection of signal ground (AB) to protective ground (AA) for DAS 820D type is identified as option X (Equipment Note 206).

D.6 FS5 and FS6 are reissued to include information in D.2 and D.5.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 3116-MOG-JES



DATA SYSTEMS
STATION
DATA AUXILIARY SETS 820D AND 820E TYPES

CHANGES

D. Description of Changes

D.1 FS6 has been revised to show the addition of one 6041H key, one D6AD cord, one KS-13491,L1, 360-ohm resistor, and one KS-13491,L2,39-ohm resistor for use in DATREX[®] remote stations. When connected as shown in FS6, the key and its associated components may be used to provide ZD option, which is key control of transmit supervision and/or ZF option, which is a camp-on signal indicator.

F. Changes in CD Section

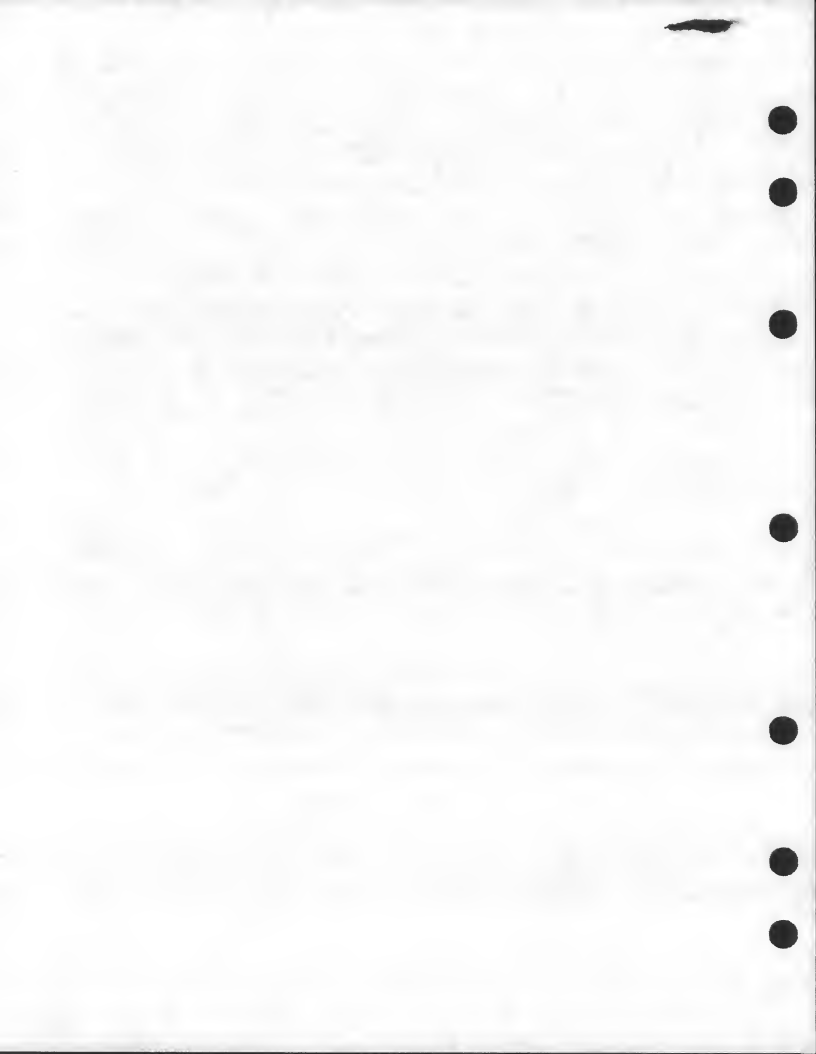
F.1 Change the first sentence in 2.05 to read:

2.05 Transmit supervision consists of a continuous transmitted space and is controlled from the terminal by means of data terminal ready lead (CD).

■ Service Mark

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DEPT 3111-LJM-JRD



DATA SYSTEMS
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NORMAL MODE	4	1.01 Data auxiliary sets (DAS) 820D and 820E type serve as interface units between a TTY or CPT and a 108- or 109-type station data set. DAS 820E is used for a multiple- station arrangement and can handle up to three stations.	
A. <u>General</u>	4	DATA AUXILIARY SET 820D	
B. <u>EIA Interface</u>	4	1.02 Data auxiliary sets (DAS) 820D1 and 820D2 are rated Mfr Disc. and are replaced by data auxiliary sets 820D-L1 equipped with an AR17 circuit pack, and 820D-L1A equipped with an AR17 circuit pack, respectively. Data auxiliary set 820D-L1 consists of a two-tone gray plastic housing which contains an 18A power unit, TEST key and lamp, a KS-19087, L2 connector, and a 61A apparatus mounting. The 61A apparatus mounting pro- vides for the mounting of a 108- or 109-type station data set. Some early models may be equipped with an AR16 circuit pack, which is	
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power rated Mfr Disc., or an AR17 circuit pack. DAS 820D-L1 (and L1A) code does not include the AR17 circuit pack. The AR17 circuit pack, or others such as the AR430 circuit pack, must be ordered separately as required. The data set is not provided with DAS 820D-L1 (or L1A), but must be furnished as required.

1.03 Data auxiliary set 820D2, which is also rated Mfr Disc., is the same as the 820D1 except that the 820D2 is not equipped with a cover for the plastic housing.

1.04 Data auxiliary sets 820D-L1 and 820D-L1A (when equipped with an AR17 circuit pack) replace data auxiliary sets 820D1 and 820D2, respectively. These newly coded data auxiliary sets together with the AR17 circuit pack replace the old sets in all applications and differ from the 820D1 and 820D2 only in the following ways:

- (a) A 26-screw terminal board replaces the 6-screw terminal board to provide greater flexibility.
- (b) Wiring is added between card connectors in order to accommodate newly developed data sets and circuit packs.
- (c) The TEST key has been rewired in order to extend the test feature of the data auxiliary set by including a test capability for half-duplex sets such as Data Set 109A. This test consists of a continuous space impressed on the line whenever the TEST key is operated. When a full-duplex data set is used, operation is identical to that of DAS 820D1 and 820D2.

DATA AUXILIARY SET 820E

1.05 Data auxiliary set 820E1 consists of three 18B power supplies, three KS-19087, L2 connectors, three KS-19089, L2 connectors, and a 59B apparatus mounting, mounted on a panel and equipped with three AP17 circuit packs. It is electrically equivalent to three data auxiliary sets 820D and can be equipped with up to three data sets. Data auxiliary set 820E1 will accommodate three data sets 108A, 108C, or 109A (in any combination), which are not provided, but must be furnished as required. The AR16 circuit pack may not be used with data auxiliary set 820E1.

1.06 Data auxiliary set 820E2 is similar to and performs the same functions as DAS 820E1 except that the three J4 connectors are replaced by the TE1 terminal strip to provide a more flexible arrangement for connection of loops and future externally controlled applications.

2. GENERAL DESCRIPTION OF OPERATION

DATA AUXILIARY SET 820D-L1 (OR L1A) EQUIPPED WITH AN AR17 CIRCUIT PACK

2.01 Data and control signals are exchanged between the data terminal and the data set via data auxiliary set 820D. Because there are no direct connections between the data set and data terminal, the data auxiliary set actually has three interfaces, one toward the data set, one toward the data terminal, and one for line and control connections. The three interfaces will be considered separately.

2.02 The signal voltages toward the data set conform to EIA standards set forth in RS-232-B for transmit, receive, and carrier detector leads. The carrier squelch lead does not use EIA voltages.

2.03 The interface toward the data terminal may be on a current or EIA voltage basis depending on the setting of a screw switch option. The following leads are used with the current interface option: transmit, receive, carrier detector, local mode control, ground, +24 volt power, and -24 volt power. If the EIA interface option is selected, the following leads are used: BA, BB, CF, CC, CA, CB, CY, AB, +P, and -P.

2.04 The interface for line and control connections provides access to the tip and ring of the data set via a screw terminal strip. Access to the TEST key and test lamp is also provided on this terminal strip.

2.05 If the station is in its normal operating mode, transmit and receive data is sent between the data set and data terminal. The station is placed in the test mode by operation of the test relay in the data auxiliary set. In the test mode, the data set is isolated from the data terminal. The receive lead of the data set is connected to the transmit lead of the data set. Any signals received from the telephone line are retransmitted to the line.

2.06 The station is placed in the local mode by operation of the local relay in the data auxiliary set. In the local mode, the data terminal is isolated from the data set. The transmit lead of the data terminal is connected to the receive lead of the data terminal. Signals on the transmit lead of the data terminal are looped to the receive lead of the data terminal.

DATA AUXILIARY SET 820E

2.07 Data and control signals are exchanged between the data terminal and the data set via data auxiliary set 820E. Because there is no direct connection between the data set and the data terminal, the data auxiliary set has three interfaces, one toward the data set, a second toward the data terminal, and the third for line and

control connections. The interfaces will be considered separately.

2.08 The interface toward the data set is the same as data auxiliary set 820D and is described in 2.02.

2.09 The interface toward the data terminal is the same as data auxiliary set 820D and is described in 2.03.

2.10 The third interface provides access to the tip and ring of the telephone line, controls the test relay, and connects to test and local contacts on the AR17 circuit pack.

2.11 Operation of data auxiliary set 820E in the normal, test, and local modes is the same as data auxiliary set 820D and is described in 2.05 and 2.06.

DATA AUXILIARY SET 820D-L1 (OR L1A) EQUIPPED WITH AN AR430 CIRCUIT PACK

2.12 Data auxiliary set 820D-L1 (or L1A) equipped with an AR430 circuit pack has two interfaces as does the 820D-L1 (or L1A) equipped with an AR17 circuit pack, one interface toward the data set and one interface toward the data terminal.

2.13 The interface toward the data set consists of the following leads: SEND DATA, RECEIVE DATA, and CARRIER DETECTOR.

2.14 The interface circuits toward the data terminal meet the electrical signal characteristics set forth in EIA Standard RS-232-B. The following interface circuits are provided: AB, BA, BB, CA, CC, CD, and CF.

2.15 Access to the data auxiliary set by the installer is via the screw terminal strip. The installer can connect the tip and ring of the data set to a telephone line. He has access to the TEST key and test lamp terminals. These terminals are actually in parallel with the test key and test lamp.

2.16 A test relay is provided on the AR430 circuit pack. When the test relay is operated and a full-duplex data set is used, the transmit and receive leads of the data set are connected together and disconnected from the AR430 circuit pack. With a half-duplex data set, a continuous space is impressed upon the transmit lead. In both cases, however, the CC lead is turned off and the PP lead is clamped marking.

SECTION II - DETAILED DESCRIPTION

1. DATA AUXILIARY SET 820D-L1 (OR L1A) EQUIPPED WITH AN AR17 CIRCUIT PACK

DATA SET INTERFACE

1.01 The interface between the data set and the data auxiliary set includes the

following leads:

- (a) **Transmit:** This lead meets the voltage requirements of RS-232-B of the EIA Standard. Data on this lead is transmitted over the telephone line by the data set.
- (b) **Receive:** This is an EIA lead. Data on this lead comes in from the line via the data set.
- (c) **Carrier-Detector:** This is an EIA lead. The state of the control signal on this lead depends on whether the data set does or does not detect carrier.
- (d) **Carrier-Squelch:** When the data auxiliary set gets a carrier-fail indication from the data set, the data auxiliary set short-circuits the Data Set 108A or 108C modulator tank circuit, squelching the outgoing carrier.

DATA OR CUSTOMER TERMINAL INTERFACE

A. General

1.02 The interface toward the data terminal may be EIA or current depending upon the setting of a screw switch option. The option allows the data auxiliary set to be used with CPTs or TTYs. When using data auxiliary set 820D, the interface is referred to as the data terminal interface; when using data auxiliary set 820E, the interface is referred to as the customer terminal interface (CUST TERM). On series 1 of data auxiliary set 820E, the customer terminal is designated J4 and on later series is designated J3.

B. EIA Interface

1.03 All the leads used with the EIA interface meet the requirements of EIA Standard RS-232-B. The interface between the data auxiliary set and the data terminal includes the following leads:

- (a) **BA:** Data is transmitted from the data terminal to the data auxiliary set.
- (b) **BB:** Data is received by the data terminal from the data auxiliary set.
- (c) **CA:** The request-to-send signal comes from the data terminal. It is looped back on the CB lead, which gives a clear-to-send indication to the data terminal. The circuit pack of the data auxiliary set has a printed wiring path between the CA and CB leads which performs the loop-around function.
- (d) **CB:** The clear-to-send signal is sent to the data terminal. This lead is tied to the CA lead as explained previously.

(e) **CC:** A data-set-ready signal is sent to the data terminal when the station is prepared for normal operation. An off indication on this lead is given when the local or test relay in the data auxiliary set is operated.

(f) **AB:** This is the signal ground lead.

(g) **CF:** A data carrier detector signal is sent to the data terminal when the data set 108 type detects a loss of received carrier or the data set 109 type detects a loop current failure.

(h) **±P:** This is the +24 volt power lead.

(i) **±G:** This is the -24 volt power lead.

(j) **CY:** A local mode control signal is sent from the data terminal to operate the local relay for local mode operation.

(k) **AA:** This is the protective ground lead.

trol source in the TTY for the local relay operation is a make-contact returned to +24 volts on pin 9 of J3.

CONTROL INTERFACE

A. Terminal Strip of Data Auxiliary Set 820D

1.05 The telephone installer has access to data auxiliary set 820D via a screw terminal strip. On data auxiliary sets 820D1 and 820D2, the terminal strip is designated TS-A. Telephone line tip and ring are connected to terminals TS-A1 and TS-A2, respectively. TS-A3 and TS-A4 provide access to the TEST key for possible remote operation. TS-A5 and TS-A6 provide access to the test lamp for possible remote indication of test relay operation. On data auxiliary sets 820D-L1 and 820D-L1A, the terminal strip is designated TB1. In this case, tip and ring are connected to terminals TB1-1 and TB1-2, respectively. TB1-5 and TB1-6 provide access to the TEST key; TB1-11 and TB1-12 provide access to the test lamp.

B. Line Termination of Data Auxiliary Set 820E

1.06 Access to data auxiliary set 820E is via the telephone line termination connector (TEL TERM). The male 25-pin connector has tip and ring connected to pins 9 and 10, respectively. Pin 13 provides access to the test relay, pin 12 to a test contact to ground, pins 27, 28, and 29 to a test transfer contact, and pins 17, 18, and 24 to a local transfer contact. On series 1 of data auxiliary set 820E, the telephone terminal is designated J3 and on later series is designated J4.

NORMAL MODE

A. General

1.07 Data is exchanged between the data set and the data terminal when the station is in the normal mode. The interface to the data terminal may be on an EIA or current basis. An indication of the presence of carrier is also sent across the interface to the data terminal.

B. EIA Interface

1.08 Assume that the EIA interface is used. Signals from the data set come in on pin 9 of connector J2 to the base of the Q6 emitter-follower. Local copy is also applied to the base of Q6. A positive voltage on either or both inputs to the base of Q6 causes the normally negative (marking) emitter of Q5 to be positive (spacing). The signal is applied to the BB lead (pin 3 of J2).

1.09 Signals from the data terminal come in on the AA lead (pin 2 of J2), pass through the data auxiliary set, and are sent to the

C. Current Interface

1.08 The current interface is intended to be used with a TTY. The interface between the data auxiliary set and the TTY includes the following leads:

(a) **Transmit:** Data is sent to the data auxiliary set from the TTY. The signal source in the TTY is a send contact which is returned to the -24 volt supply of the data auxiliary set. A send loop is formed which consists of a lead from pin 2 of connector J3 through the send contact of the TTY and back to -24 volts on pin 10 of connector J3. (On series 1 of data auxiliary set 820E, connector J3 is designated J4 and connector J4 is designated J3.)

(b) **Receive:** Data is sent by the data auxiliary set to the TTY. The load in the TTY is a select magnet driver which has an input impedance of 680 ohms and is returned to the -24 volt supply of the data auxiliary set. A receive loop is formed which consists of a lead from pin 3 of connector J3 through the selector magnet driver of the TTY and back to -24 volts on pin 10 of J3.

(c) **Carrier Detector:** If carrier is present, a short to ground appears on pin 8 of connector J3; when carrier is lost, an open to ground appears. The minimum allowable load on pin 8 of J3 is 2000 ohms to +24 volts on pin 9 of J3.

(d) **Local Mode Control:** The local relay in the data auxiliary set is operated by applying a signal on pin 12 of connector J3 from the TTY. The con-

data set via pin 4 of connector J2. Local copy is generated by feeding back part of this signal through diode CR1 to transistor Q6.

1.10 During normal operation with carrier present, the control signal from the data set (which indicates whether carrier is present or not) holds the Q1 transistor off, the Q2 transistor on, and the Q3 emitter-follower positive. If the incoming carrier fails, the control signal holds the Q1 transistor on, the Q2 transistor off, and the Q3 emitter-follower negative.

1.11 The collector of transistor Q1 is connected in parallel with the outgoing carrier tank circuit. If the Q1 transistor is turned off, the outgoing carrier is not affected; but, if transistor Q1 is turned on, outgoing carrier is squelched.

1.12 Transistor Q2 is associated with the space-hold feature on a carrier fail. This feature is used with the current interface only and will be discussed later.

1.13 Transistor Q3 is an emitter-follower which provides an interface for the carrier control signal to the data terminal. The control signal simply passes from the data set to the data terminal.

C. Current Interface

1.14 Assume that the current interface is used. Signals from the data set come in on pin 9 of connector J2 to the base of the Q6 emitter-follower. Local copy is also applied to the base of Q6. A positive voltage on either or both inputs to the base of Q6 causes the normally negative (marking) emitter of Q6 to be positive (spacing). From the emitter of Q6, the signal is applied to the base of Q4, turning Q4 on when marking and off when spacing. The collector of Q4 drives the receive loop to the selector magnet driver of the TTY.

1.15 Signals from the TTY are generated by the send contact and come in on pin 2 of connector J2. The signals pass through the data auxiliary set and are sent to the data set via pin 4 of J2. Local copy is generated by feeding back part of this signal through diode CR1 to transistor Q6.

1.16 During normal operation, the carrier detector circuits work as do the EIA interface except for the following differences. Q3 is not used as an emitter-follower, but is arranged to send a ground short or an open circuit to the TTY when carrier is present or not present, respectively. Normally, when the incoming carrier is lost, a mark hold is applied to the receive loop. Q2 is used to generate a space hold on loss of carrier. If carrier is lost, Q2 turns off causing Q4 to turn off. When Q4 is off, the receive loop is spacing.

1.17 The carrier squelch circuit for current interface works the same as the carrier squelch circuit for EIA interface.

TEST MODE

A. Data Auxiliary Set 820D

1.18 The purpose of the test mode is to provide for a loop-around test of data coming in over the telephone line when using full-duplex data sets or to provide a send space signal when using half-duplex data sets. When using full-duplex data sets, signals on the receive lead from the data set are retransmitted over the transmit lead of the data set. When half-duplex data sets are used, a continuous space is sent over the transmit lead.

1.19 The test relay is operated by applying a ground to pin 13 of connector J2. Pin 13 is wired to one side of the TEST key. On data auxiliary sets 820D1 and 820D2, the other side of the TEST key is wired to pin 4 of the data set connector, and pin 2 of the same connector is wired to ground. A printed wiring path from pin 2 to pin 4 of Data Sets 108A and 108C provides continuity. Data Set 109A does not have this printed path preventing operation of the test relay. The contacts on the test relay are used to perform a number of functions. The receive lead is connected to the transmit lead of the data set and the signals from the data terminal are blocked. When in the test mode, local copy is blocked. A test contact in conjunction with a screw switch option sends a copy of data that is being looped back to the telephone line to the data terminal. A test contact in the collector of the Q1 carrier squelch transistor ensures that a loss of incoming carrier always causes a loss of outgoing carrier when in the test mode. A test relay make-contact to ground is accessible on pin 12 of J2 and is used to light an external test lamp. A test relay break-contact is in the operating path of the local relay. It has the dual function of releasing the local relay, if operated when going into the test mode, and of giving an off indication on the data-set-ready lead (CC). On data auxiliary sets 820D-L1 and 820D-L1A equipped with an AR17 circuit pack, operation of the test relay performs the same functions as described above when using a data set 108 type. However, when using a half-duplex type data set (such as the 109A), a different type of test is possible. The operation of the test relay is made possible by a chassis wiring change, the removal of the wire connecting one side of the TEST key to pin 4 of the data set connector, and connecting the TEST key directly to ground. The AP17 circuit pack, unlike the AR16, has a test relay transfer contact which is accessible via connector J2. The send data lead of the data set has been rerouted through this transfer contact of the test relay. When the relay is not operated, signals are transmitted in the normal manner; but, when the relay is

operated, the send data lead of the data set is transferred to a positive voltage causing a continuous space to be transmitted.

Note: An AR16 circuit pack is not compatible with a DAS 820D-L1 or 820D-L1A.

B. Data Auxiliary Set 820E

1.20 The test relay is operated by applying a ground to pin 13 of the telephone line termination connector at the remote end. Pin 13 is wired to pin 2 of connector J1. A printed wiring path from pin 2 to pin 4 on Data Set 108A or 108C provides continuity to pin 4 of connector J1. Data Set 109A does not have this printed path; therefore, the test relay cannot operate. A wire from pin 4 of connector J1 to pin 13 of connector J2 completes a path for operation of the test relay. The contacts on the test relay are used to perform a number of functions. The receive lead is connected to the transmit lead of the data set, and the signals from the data terminal are blocked. When in the test mode, local copy is blocked. A test contact in conjunction with a screw switch controls a copy of data that is being looped back to the telephone line to the data terminal. A test contact in the collector of the Q1 carrier squelch transistor ensures that a loss of incoming carrier always causes a loss of outgoing carrier when in the test mode. A test relay make-contact to ground and a test transfer contact are wired to the telephone terminal connector for use at the remote end. A test relay break-contact is in the operating path of the local relay. It has the dual function of releasing the local relay, if operated, when going into the test mode and of giving an off indication on the data-set-ready lead (CC).

1.21 The AP16 circuit pack is rated Mfr Disc. and may not be used with data auxiliary set 820E.

LOCAL MODE

1.22 The purpose of the local mode is to provide an off-line loop-around connection between the transmit and receive leads of the data terminal.

1.23 The local relay is operated by applying a positive voltage to pin 11 of connector J2. The contacts of the local relay are used to perform a number of functions. The transmit lead is connected to the receive lead of the data terminal and signals from the data set are blocked. The transmit lead of the data set is clamped marking. A local relay break-contact is used with the CC lead. When the local relay is operated, the break-contact contact gives an off indication on the data-set-ready lead.

1.24 The AR17 circuit pack, unlike AP16, has a local relay transfer contact which is accessible via connector J2.

OPTIONS

1.25 The data auxiliary set has the following options:

- (a) EIA or Current Interface: By adjusting nine screw switches on the circuit pack, the interface toward the data terminal may be set for EIA or current interface. The EIA interface is usually used for CPT, and the current interface is usually used with a TTY.
- (b) Copy or No Copy in the Test Mode: By adjusting a screw switch on the circuit pack, a copy of the data which is being looped around through the data set may be sent to the receive lead of the data terminal. By resetting, the screw switch is adjusted in an opposite manner. Signals are blocked and do not reach the data terminal.
- (c) Local Copy: By closing a screw switch on the circuit pack, a copy of the data which is being sent by the data terminal from the transmit lead is coupled back to the receive lead. If the screw switch is opened, signals are not coupled from the transmit to receive leads of the data terminal.
- (d) Mark or Space Hold on Carrier Fail: When the data auxiliary set is used with the EIA interface, either mark hold or space hold is available. With the current interface, either mark or space hold is available. By opening a screw switch on the circuit pack, this option is changed from a mark hold to a space hold.
- (e) Carrier Squelch on Carrier Fail: By closing a screw switch on the circuit pack, the collector of Q1 is connected across the outgoing carrier tank circuit. Q1 turning on will squelch outgoing carrier on an incoming carrier fail.

2. DATA AUXILIARY SET 820D-L1 (OR L1A) EQUIPPED WITH AN AR430 CIRCUIT PACK

DATA SET INTERFACE

2.01 The interface between the data set and the data auxiliary set includes the following leads:

- (a) Send Data: Data on this lead is transmitted over the telephone line by the data set.
- (b) Receive Data: Data on this lead comes in from the line via the data set.
- (c) Carrier Detection: The state of the control signal on this lead depends on whether the data set does or does not detect carrier.

EIA INTERFACE

2.02 The interface between the data terminal and the data auxiliary set should meet the electrical signal characteristics set forth in EIA Standard RS-232-B. The following interface circuits are provided:

- (a) **AB:** Signal ground lead.
- (b) **BA:** Data is transmitted from the data terminal to the data auxiliary set.
- (c) **BB:** Data is received by the data terminal from the data auxiliary set.
- (d) **CA:** The request-to-send signal comes from the data terminal. This lead may be optionally looped to the CB lead.
- (e) **CB:** The clear-to-send signal is sent to the data terminal. This lead may be optionally strapped to the CA lead or the CC lead.
- (f) **CC:** A data-set-ready signal is sent to the data terminal when the station is prepared for normal operation.
- (g) **CD:** Signals on this circuit are used to control switching of the signal converter to the communication channel.
- (h) **CF:** A data carrier detector signal is sent to the data terminal when the data set 108 type detects a loss of received carrier or the data set 109 type detects a loop current failure.

NORMAL MODE - SEND

2.03 Signals from the data terminal come in on the BA lead, pin 2, to the base of Q3. Assuming a steady mark at the input, Q3 turns off. Capacitor C1 charges toward +24 volts and transistor Q1 turns on, provided the CD lead has been properly conditioned to turn on Q2, the emitter return path for Q1. With Q1 on, its collector voltage goes to ground and a mark is applied to pin 4. When the input goes spacing, Q3 turns on grounding the junction of C1, R4, and CR3. Since C1 was charged to +24 volts, grounding this point drives the other side of C1 to -24 volts turning off Q1 and applying a space to pin 4. If the input then goes marking, Q3 will turn off again, Q1 will turn on again, and a mark will once more be applied to pin 4. If, however, the space persists, C1 will discharge from -24 volts and charge toward +24 volts via resistor R3. When the voltage crosses the 0-volt point, Q1 will turn on again, thus limiting the time a space can be sent to approximately 580 ms.

NORMAL MODE - RECEIVE

2.04 Signals from the data set side enter the circuit pack on pin 9 and are directed to the bases of transistors Q4 and Q7. An

incoming mark turns on Q7 which turns off Q8. When Q8 turns off, -24 volts is applied to the base of emitter-follower Q9 through a 10-kilohm resistor. This immediately sinks current from the emitter circuit of transistor Q9, causing capacitor C2 to charge to a voltage slightly less negative than -24 volts via the low impedance of the Q9 emitter, diode CR8, and resistor R22. When the incoming signal is a space, transistor Q7 turns off causing transistor Q8 to conduct. This places a ground at the base of transistor Q9 and, since capacitor C2 in the emitter circuit of Q9 was charged to -24 volts, the emitter base junction of Q9 in series with diode CR8 is back-biased and no current flows in the Q9 emitter. Capacitor C2 now begins to discharge from -24 volts and charges toward +24 volts via resistors R21 and R22. Since the charging resistance toward -24 volts is very much smaller than the charging resistance toward +24 volts in a normal data stream of marks and spaces, C2 will remain at substantially -24 volts. With C2 charged to a negative potential, diode CR9 which connects between the emitter circuit of Q9 and the base of Q10 is back-biased keeping transistor Q10 turned off. When transistor Q10 is cut off, diode CR7 which is connected between the Q5 base and Q10 collector is back-biased keeping Q5, which is in series with the emitter of Q4, saturated placing the emitter of Q4 very close to ground. This allows transistor Q4 to act as a typically grounded emitter transistor switch, allowing signals to pass from its base input to its collector output and on to the EIA driver transistor Q6. If the incoming signal becomes a steady space, C2 begins charging toward +24 volts and, after approximately 1.2 seconds, the voltage on C2 will cross the 0-volt point at which time CR9 will become forward-biased and transistor Q10 will begin to conduct. When Q10 conducts, its collector drops to zero causing diode CP7 to conduct. When CR7 conducts, transistor Q5 cuts off opening the emitter of Q4 and cutting it off. With Q4 off, Q6 is cut off and output lead BB is clamped marking regardless of the length of time the space persists.

TRANSMIT AND RECEIVE SUPERVISION

A. Transmit

2.05 Transmit supervision consists of a continuous transmitted space and is controlled

2.10 Data auxiliary set 820-L1 (or ready lead (CD). The off condition of the CD lead places a negative voltage at the base of transistor Q2. This negative voltage causes Q2 to turn off opening the emitter return path of Q1, which causes the send data lead to transmit a continuous space (to pin 4) regardless of the condition at the input (pin 2). When CD is turned on, Q2 is similarly turned on, grounding the emitter of transistor Q1. This is the condition for normal data transmission.

B. Receive

2.06 Receive supervision is optional and consists of the detection of a long space from the data set which turns off terminal interface lead data set ready (CC). Lead CC may be turned off in one of three ways: by turning off lead CD, by receiving a long space (if option F is provided), or by receiving a loss of carrier indication from the data set. This is accomplished via the three input gates (CR9, CR11, and CR17) connected at the base circuit of transistor Q9. Normally, the CC lead is turned off whenever the CD lead at the same station is turned off; however, option A is provided to disable the features so that the data set ready lead may be controlled only by the incoming line signals, long space, and carrier fail. When option A is connected in the circuit and CD is turned off (transistor Q2 turned off), diode CR17 is forward-biased and a positive signal is applied to the base of Q10 turning it on. With Q10 on, its collector goes to ground turning off Q11 applying a negative (off) signal to pin 5, the data set ready lead. Independently of this when a space is received, it is directed to the base of transistor Q7 turning it off and, provided option F is connected, turns Q8 on. With Q8 on, emitter-follower Q9 is turned off and capacitor C2, which for normal data received remains at substantially -24 volts, now begins to charge toward +24 volts through R21 and R22. After approximately 1.2 seconds, the voltage on C2 crosses the 0-volt point and turns transistor Q10 on. With Q10 on, Q11 is turned off applying a negative (off) signal to pin 5 (CC lead). The third independent control, as previously mentioned, is carrier fail. Pin 18, the carrier detect lead of the data set side, is continuous with pin 19, the CF lead on the terminal side. CF is therefore directly controlled by the signal presented by the carrier detect lead of the data set. In addition, pin 14 is also connected to the base circuit of transistor Q12. When a loss of carrier is detected, a negative voltage is applied to the base circuit of Q12. This turns off Q12 and turns on Q10 via resistor R30 and gating diode CR11 and, as previously mentioned, Q10 on turns off Q11 which results in lead CC turning off.

CAMP-ON SIGNAL DETECTOR

2.07 With option E in the circuit, an option which is mutually exclusive of option F, receive supervision is removed and the timer input is inverted. The timer now becomes a pulse stretcher for spacing signals. The timer output is connected to a lamp driver and the entire circuit becomes a camp-on signal detector. When one side of a suitable lamp (such as a 51A lamp) is connected to pin 35 and the other side of the lamp is connected to +24 volts, the circuit operates in the following manner. With a steady mark on pin 9 of the circuit pack, transistor Q7 is bypassed with option E and Q8 is turned on causing emitter-follower Q9

to be turned off. Capacitor C2 charges toward +24 volts through R21 and R22, turning on transistor Q13. With Q13 on, Q14 is turned off and the camp-on lamp is off. When a space is received, Q8 turns off turning on Q9. C2 now begins to charge rapidly toward -24 volts through R22 and CR8 via the emitter of Q9. Q13 is turned off, turning on Q14 which causes the camp-on lamp to be lighted. When the input goes back to a mark, Q8 is again turned on turning off Q7, and C2 begins to slowly charge toward +24 volts again keeping the lamp on for approximately 1 second after the spacing signal ceases. Therefore, when a camp-on signal (consisting of approximately 3 seconds mark and 6 milliseconds space) is received, the lamp flashes at a rate of 2 seconds off and 1 second on. Consequently, when receiving data the camp-on lamp remains on.

OPTIONS

2.08 Option A is CC turned off by CD. Option E (mutually exclusive of option F) is a camp-on detector. Option F is a receive-space timer. Option G (mutually exclusive of option H) is CB looped to CC. Option H is CA looped to CB.

TEST MODE

2.09 A test relay is provided on the circuit pack and may be operated from either the push-push TEST key on the DAS 820D-L1 or from a switch remote from the 820D by means of terminals 5 and 6 located on terminal strip TB-1 on the 820D. When the test relay is operated and a full-duplex data set is used, the transmit and receive leads of the data set are connected together and disconnected from the AR430 circuit pack. With a half-duplex data set, a continuous space is impressed upon the transmit lead. In both cases, the CC lead is turned off and BB lead is clamped marking.

FEATURES

2.10 The data auxiliary set 820D-L1 (or L1A) equipped with an AR430 circuit pack has the following features.

- Transmit Supervision:** The CD lead is gated to the transmit lead, so that in the CD off condition the transmit lead is clamped spacing.
- Optionally, receive supervision or camp-on signal detection.
- Send Space Timing:** This prevents a false transmit supervision signal from being sent due to a space impressed on the transmitted data lead which exceeds the maximum permitted timing for a space by limiting the maximum space length to 750 milliseconds.

- (d) Optional control of CC lead by CD lead of the same station.
- (e) Mark hold on carrier fail.
- (f) Mark hold on receive supervision off.

3.06 To provide a mark or space hold under carrier fail conditions on an optional basis when using a current interface (AR17 circuit pack only).

3.07 To provide carrier squelch under carrier fail conditions on an optional basis (AR17 circuit pack only).

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 Power Supply: Data auxiliary set 820D uses an 18A power supply, and data auxiliary set 820E uses three 18B power supplies. Both supplies have an output of $\pm 24 \pm 3$ volts and -24 ± 3 volts.

1.02 Temperature and Humidity: Data auxiliary sets 820D and 820E can operate over a temperature range of 40° to 200° and a relative humidity range of 20 to 95 percent.

2. FUNCTIONAL DESIGNATIONS

2.01 The fundamental meanings of the designations of the operating elements of data auxiliary sets 820D and 820E are as follows:

- (a) Test Relay: Puts the data auxiliary set in the test mode.
- (b) Test Lamp: On data auxiliary set 820D, the test lamp lights when in the test mode.
- (c) Local Relay: Puts the data auxiliary set in the local mode.

3. FUNCTIONS

3.01 To provide an interface between the data set and the data terminal.

3.02 To receive data from the telephone line and retransmit the data back over the line when in the test mode on full-duplex or send space on half-duplex.

3.03 To loop transmit data from the data terminal back to the receive port of the data terminal when in the local mode (AR17 circuit pack only).

3.04 To provide local copy to the data terminal on an optional basis (AR17 circuit pack only).

3.05 To provide data from the telephone line to the data terminal on an optional basis when in the test mode.

4. CONNECTING CIRCUITS

4.01 When this circuit is listed on a keysheet, the information thereon is to be followed. This circuit will function with the following data system circuits.

- (a) Data Set 108A - SD-3D024-01.
- (b) Data Set 109A - SD-3D025-01.
- (c) Data Set 108C - SD-3D032-01.
- (d) 13A1 Data Unit - SD-3D046-01.
- (e) 6A1 Data Mounting - SD-1D114-01.
- (f) Data Set 108D - SD-73060-01.
- (g) Data Set 109D - SD-1D172-01.

5. MANUFACTURING TESTING REQUIREMENTS

None.

SECTION IV - REASONS FOR REISSUE

B. Changes in Apparatus

B.1 Data auxiliary sets 820D-L1/2 and L1A/2 are rated Mfr Disc. and are replaced by DAS 820D-L1 equipped with an AR17 circuit pack and DAS 820D-L1A equipped with an AR17 circuit pack.

D. Description of Changes

D.1 Wiring has been added between connector J1 and terminal board TB1 to accommodate 4-wire data sets.

D.2 The AR430 circuit pack has been added for station use in private line quasi-ternary point-to-point communications systems and for DATREX remote stations.

BELL TELEPHONE LABORATORIES, INCORPORATED

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